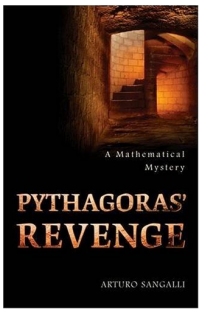
Pythagoras' revenge, a mathematical mystery. Arturo Sangalli, Princeton University Press, 2009, 183 p., ISBN: 978-0-691-04955-7.



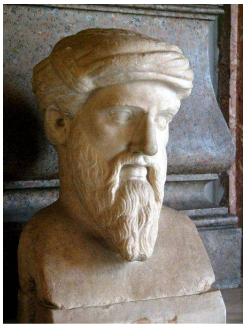
Pythagoras was born on Samos around 570 BC and has been most influential on mathematics, politics, religion and philosophy.

Pythagorean philosophy is dominated by numbers and mathematics. There were two kinds of followers: the *akousmatikoi* or "listeners" and the *mathematikoi* or "learners". It is generally accepted that his philosophy was highly influential for later philosophers like e.g. Plato. The *mathematikoi* were considered to be more advanced and better skilled in the fundamental theory. Pythagoreans were convinced that numbers rule nature (from the music of the planets to the scales of music). They also believed in the reincarnation of the soul in another animal life form, which is why they were vegetarian. The Pythagoras adepts had a lot of opposition and there was even a general uprise against them. In the second and first century BC, the original ideas were revived by the Neo-Pythagoreans.

The Pythagorean philosophy may be somewhat less known to a general public, his influence on mathematics and mathematical teaching has been very important. The Pythagorean theorem is one of the items in mathematics that seems to be accepted as belonging to the cultural backpack of anyone who pretends to be intelligent. Most of the time even politicians know the theorem, or at least it does not show bad taste to confess that one has heard of it. Ironically, the Pythagorean adepts believed in the ratio of integers and it is exactly his theorem that exposes in the isosceles case the square root of 2. Therefore Pythagoreans tried to cover this up and the Greek preferred geometry over numbers until Descartes restored numbers in the 16th century.

Pythagoras statue on Samos

Even though Pythagoras has had a big impact on Western civilization, there is no written document left from his hand. So all we know is second hand which is a source of mystery and legends. For example, there is a legend saying that his enemies had put his house on fire so that Pythagoras had to flee, but suddenly he halted, turned around and said that he'd rather die than run away, whereupon his pursuers cut his throat.

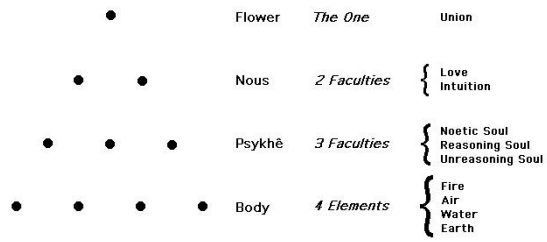


Pythagoras

In the wake of the hype caused by Dan Brown's *Da Vinci code* Arturo Sangalli has found inspiration in all the previous characteristics of Pythagoras and the Pythagoreans to write his mathematical analog. Pythagoras being popular or at least known by many people, the mysteries about his person and the sect-like air haunting (Neo)Pythagoreanism, is indeed a good choice. Sangalli has a PhD in mathematics and as a free lance journalist has previously authored books on the interface between mathematics and computer science.

Sangalli designs a plot where a Neo-Pythagorean sect "the Beacon" believes that Pythagoras predicted that he would be reincarnated around

the middle of the 20th century. So they start looking for their "Dalai Lama" via the internet. They believe that Norton Thorp, a world renown mathematician is "The One". On the other hand, there is an Oxford professor in classical history, Elmer Galway, who happens to discover a parchment book containing an Arabic translation of an old text that refers to a scroll allegedly written by Pythagoras, the Master himself. The other part of the book is discovered by the sect, so that both parties are in search of the other half of the information. Finally the papyrus scroll is found by Norton in some underground basilica in Rome[1], thanks to a carving of the tetractys, the 10-dotted triangle, a Pythagorean symbol. The parallel with the *Da Vinci Code* is striking: the mystic locations, the sect of "bad guys", the intelligent "hero" Galway, and the legacy of a secretly hidden message passed on by a great historical figure.



Tetractys

Without giving away the story, I can try to explain the title. Thorp is traced by the sect with the help of Jule Davidson, a young mathematician who is solving difficult mathematical puzzles on the internet. But Thorp turns out to be in fact an Anti-Pythagoras (in the sense of an Anti-Christ). Johanna, Jule's twin sister, is a specialist in computer security and as you may know, computer security is related to number theory and random numbers. She so happens to attend one of Thorp's lectures where he is preaching that nature is essentially randomness, i.e., completely unpredictable and therefore it is also at the heart of mathematics. "Solvable problems are like a small island in an ocean of undecidable propositions." This is of course the opposite of Pythagoras' views which means de facto the complete debacle of the sect because what Pythagoras predicted, according to their beliefs, is in fact his own anti-self.

Impossible configuration of the 15-puzzle

The book has interesting expositions about philosophy, history and of course mathematics. The latter are easily accessible for non mathematicians too. There are some appendices going a bit deeper into some of the mathematics, but often, Sangalli lets one of the characters of the book explain it. So you can find something about the unsolvable 15-puzzle and combinatorics, and about random numbers and how they are generated etc. Even lovers of mystery tales may like this story. Although the "Indiana Jones" adventure-value is rather low and some portions of the text might remind them too much of their boring mathematics lessons. This is a fiction novel after all and sometimes, me too, I find some parts of the text too much approaching lecture notes of a popular course on mathematics. Especially when one of the characters is "teaching" it feels like a bit artificial. Also the author could have saved on the number of characters. Some are introduced just to let them tell their part of the story, but they do not play a role in the rest of the novel. The suspense is kept at a good level though, and several unexpected twists in the story keep you reading on, even with the interfering "expositions" of a more philosophical or mathematical nature.

Adhemar Bultheel

[1]This basilica near the *Porta Maggiore* on *Via Praenestina* in Rome does indeed exist and was used by the Neo-Pythagoreans in the first century AD, but it was only discovered in 1915.